Surgical Management of Gastroesophageal Cancer in China

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I have no relevant financial or nonfinancial relationships to disclose.
GC is a great burden in China
The distribution of GC in China is not even
The nation-wide data of GC surgical treatment is limited in China
Zhongshan Hospital of Fudan University

• In Shanghai city, built in 1936
• Initiated and donated by Chinese famous politicians and celebrities
• To memorize Dr. Sun Yat-sen, Father of modern China

Department of General Surgery, Zhongshan Hospital
• Zhongshan Hospital now has 2300 beds
• The largest GI Surgical Center in south China:
  ✓ Esophageal cancer surgery: >500/year
  ✓ Radical gastrectomy: >1,500/year
  ✓ Colorectal cancer surgery: >1,700/year
  ✓ Liver resections: >4,000/year
  ✓ Pancreatic cancer surgery: >150/year
✓ GI endoscopy:
  • Operated by surgeons of general surgery
  • screening: >100,000/year
  • ESD: >1,000/year (stomach, colon and rectum)
  • POEM (peroral endoscopic myotomy): >400/year
In 2016

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpatients</td>
<td>12,791</td>
</tr>
<tr>
<td>Outpatients</td>
<td>194,888</td>
</tr>
<tr>
<td>Emergency patients</td>
<td>25,014</td>
</tr>
<tr>
<td>Total Operations</td>
<td>11,327</td>
</tr>
<tr>
<td>Emergency operations</td>
<td>1,272</td>
</tr>
</tbody>
</table>

- Re-operation Rate: 0.35%
- Post-operation mortality: 0.24%
Gastroesophageal cancer

- Two recognized tumor types
- Esophagogastric junction cancer (EGJ cancer): tumors arising between 5 cm proximal to the z-line and 5 cm distal to the z-line into the stomach
- Gastric cancer: tumors arising anywhere 5 cm distal from the z-line to the pylorus

EGJ cancer and Siewert Classifications

- Adenocarcinoma of EGJ (AEG)
- Type I: centre located within between 1-5cm above the anatomic EGJ
- Type II: within 1cm above and 2cm below the EGJ
- Type III: 2-5cm below EGJ
AEG is quite different between U.S.A and China

• In U.S.A:
  ➢ The incidence of AEG continues to rise
  ➢ An estimated 350% increasing in the last three decades
  ➢ 60-70% esophageal cancer is adenocarcinoma
  ➢ *Most of AEG in U.S.A are Siewert type I*

• In China:
  ➢ Incidence of AEG is rising slowly, mainly due to AEG type II and III
  ➢ *More than 95% of esophageal cancer is squamous cell cancer, adenocarcinoma is only 1%*
  ➢ *More than 95% AEG in China are type II and III*

*Discov Med 16(87):103-11, 2013.*
Both esophageal adenocarcinoma and type I AEG are rare in China.

The percentage of esophageal cancer in Zhongshan Hospital (2016):

- Adenocarcinoma: 440 (98.88%)
- Type I: 5 (1.12%)

The percentage of different types AEG in Zhongshan Hospital (2016):

- Type I: 1.43%
- Type II, III: 98.57%
AEG lymph node Metastasis are mainly at perigastric area.

The lymph flow of AEG mainly goes to abdomen and only very little flow goes up to thorax, so the most lymph node metastasis of AEG were found at the perigastric area and the rest metastastic lymph node usually were found around the esophageal hiatus.

More and more AEG are treated by abdominal surgeons and GC surgical specialists in China.

Surgical practice for GC in China
What happened in GC treatment during the last two decades in China?
Brief review of GC Practice in China

Phase 1
No Standards

Phase 2
D2 gastrectomy

Phase 3
Personalized treatment

2000

D2 for EGC

D2+ for AGC

D3 for AGC

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D2 lymphadenectomy is standard procedure now.

Phase 1
No Standards

Phase 2
D2 gastrectomy

Phase 3
Personalized treatment

2000-2010

Brief review of GC Practice in China

Opening ceremony of Nation-wide D2 gastrectomy Trainers
8 years 33 provinces and areas 2000 trainees
D2 distal gastrectomy video
Phase 1
No Standards

Phase 2
D2 gastrectomy

Phase 3
Personalized treatment

Brief review of GC Practice in China
Laparoscopic Gastrectomy
Robotic Gastrectomy
Prof. Zhou doing ESD
Brief review of GC Practice in China

Phase 1
No Standards

Phase 2
D2 gastrectomy

Phase 3
Personalized treatment

2000

MDT via telemedicine
<table>
<thead>
<tr>
<th>Surgeon</th>
<th>Approach</th>
<th>Gastrectomy</th>
<th>Lymphadenectomy</th>
<th>Anastomosis</th>
<th>Leakage</th>
<th>Concerns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thoracic surgeon</td>
<td>Trans-thoracic</td>
<td>proximal</td>
<td>No systemic</td>
<td>Hand suture</td>
<td>High: 5%</td>
<td>Safety</td>
</tr>
<tr>
<td>Abdominal surgeon</td>
<td>Abdominal transhiatal</td>
<td>total</td>
<td>Systemic</td>
<td>stapler</td>
<td>Low: 0.57%</td>
<td>Prognosis Quality of life</td>
</tr>
</tbody>
</table>

*Zhongshan unpublished data*
Video: AEG
Video: Splenic Hilar Nodes Dissection
Current status of GC surgical practice
A survey of surgical treatment of gastric cancer in China

- Initiated by The committee of Oncological Surgeons of the Chinese Medical Association (CMA) in 2014
- Headed by Prof. Jiafu Ji (Peking University Cancer Hospital)
- Aim: to know the current status of surgical treatment of gastric cancer in China
- Finally, 24,035 GC case of underwent surgery in 2014 from 37 hospital were analyzed
Results—participating hospitals and their distribution

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Results - EGC

Endoscopic procedures (28%)

Open surgery (33%)

Laparoscopic surgery (39%)

<table>
<thead>
<tr>
<th></th>
<th>Gastrectomy</th>
<th>LN metastasis positive</th>
<th>Percentage of LN metastasis positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>pT1a</td>
<td>1534</td>
<td>79</td>
<td>5.15%</td>
</tr>
<tr>
<td>pT1b</td>
<td>1808</td>
<td>337</td>
<td>18.64%</td>
</tr>
</tbody>
</table>
Results—advanced gastric cancer (AGC) and surgical treatment

<table>
<thead>
<tr>
<th></th>
<th>Open Gastrectomy</th>
<th>Laparoscopic Gastrectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cases</td>
<td>12831</td>
<td>5223</td>
</tr>
<tr>
<td>Percentage of R0 resection</td>
<td>93.7%</td>
<td>96.9%</td>
</tr>
</tbody>
</table>
### Results - Lymph nodes dissection

Average number of lymph nodes harvested in D2 surgery: **27.06**

<table>
<thead>
<tr>
<th>Top 10 Hospitals</th>
<th>The average number of LN dissected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nanfang Hospital, Southern Medical University</td>
<td>62</td>
</tr>
<tr>
<td>Sun Yat-sen University Cancer Center</td>
<td>44.5</td>
</tr>
<tr>
<td>West China Hospital, Sichuan University</td>
<td>41.3</td>
</tr>
<tr>
<td>Fujian Medical University Union Hospital</td>
<td>39.46</td>
</tr>
<tr>
<td>Zhongshan Hospital, Fudan University</td>
<td>39</td>
</tr>
<tr>
<td>The Affiliated Hospital of Qingdao University</td>
<td>38.7</td>
</tr>
<tr>
<td>No.1 Hospital of Jilin University</td>
<td>33.9</td>
</tr>
<tr>
<td>Ruijin Hospital Shanghai Jiao Tong University School of Medicine</td>
<td>31</td>
</tr>
<tr>
<td>Fourth Hospital of Hebei Medical University</td>
<td>30.4</td>
</tr>
<tr>
<td>Shandong Provincial Hospital</td>
<td>29</td>
</tr>
</tbody>
</table>
Results - Procedures and reconstructions

- Total gastrectomy: 60%
- Distal gastrectomy: 60%
- Roux-en-Y reconstruction: 92%
- Others: 8%
- Billroth I: 40%
- Billroth II: 44%

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Unpublished data
# Results: Safety of Surgery

## The rate of reoperation: **1.10%**

<table>
<thead>
<tr>
<th>Causes for re-operation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemorrhage</td>
<td>45.8%</td>
</tr>
<tr>
<td>Anastomosis leakage</td>
<td>14.0%</td>
</tr>
<tr>
<td>Intestinal obstruction</td>
<td>13.3%</td>
</tr>
<tr>
<td>Incision dehiscence</td>
<td>6.1%</td>
</tr>
<tr>
<td>Abdominal abscess</td>
<td>4.2%</td>
</tr>
<tr>
<td>Intestinal fistula</td>
<td>0.8%</td>
</tr>
<tr>
<td>Intussusception</td>
<td>0.8%</td>
</tr>
<tr>
<td>Deep venous thrombosis</td>
<td>0.4%</td>
</tr>
<tr>
<td>Appendicitis</td>
<td>0.4%</td>
</tr>
<tr>
<td>Cholecystitis</td>
<td>0.4%</td>
</tr>
<tr>
<td>Margin positive</td>
<td>0.4%</td>
</tr>
<tr>
<td>Drainage tube broken</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

## Peri-operative Mortality: **0.22%**

<table>
<thead>
<tr>
<th>Death Cause</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemorrhage</td>
<td>31.5%</td>
</tr>
<tr>
<td>Severe Infection</td>
<td>16.7%</td>
</tr>
<tr>
<td>Anastomosis leakage</td>
<td>16.7%</td>
</tr>
<tr>
<td>Cardio cerebral vascular accident</td>
<td>9.3%</td>
</tr>
<tr>
<td>Organ functional failure</td>
<td>7.4%</td>
</tr>
<tr>
<td>Duodenal stump fistula</td>
<td>5.6%</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>3.7%</td>
</tr>
<tr>
<td>Others</td>
<td>9.3%</td>
</tr>
</tbody>
</table>

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Zhongshan

Experience in surgical practice of gastric cancer
Gastric Cancer Surgical Group (GCSG)

Three periods

- ~2003: extended lymphadenectomy
- 2003~2008: D2 is standard
- 2009~: MDT and personalized

Establishment of GCSG

2003

D2 lymphadenectomy and national training programs

2008

Laparoscopic gastrectomy, GC-MDT

2009

National training programs for GC-MDT and minimally invasive GC surgery; initiate GC clinical trials.

2010

Robot-assistant gastrectomy

2011

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Increase of radical gastrectomy in Zhongshan

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Our principles for surgical practice

Early gastric cancer
- ✔️ ESD
- ✔️ Lap surgery

Advanced gastric cancer
- ✔️ Open surgery
- ✔️ TH approach for AEG(type II, III)
- ✔️ Lap surgery just for trials
- ✔️ Neo-chemotherapy for T4

Detailed pre-operative assessments for AGC
- ✔️ MDT for complicated cases
- ✔️ Lap exploration and peritoneal cytology are routine

Reconstruction
- ✔️ DG: Roux-en-Y, Billroth I, Billroth II with Braun
- ✔️ TG: Roux-en-Y

Severe complications management
- ✔️ Senior get involved
- ✔️ Group discussion

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About 10% of radical gastrectomy

- Lower diagnostic rate of EGC in China (about 20%)
- With strict indications

In 2016: 153 cases, 9.6%

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Video: Laparoscopic Total Gastrectomy for Early Type II AEG
Video: Laparoscopic Esophagojejunostomy
Quality control

✓ R0 resection
✓ Routine frozen section for AEG and signet-ring cell GC
✓ Lymph node dissection
  • DG >25; TG >40
✓ Post-operative morbidity and mortality
### Training and high-volume leads to safer surgical outcomes

**Surgical complications (12.27%)**

<table>
<thead>
<tr>
<th>Complications</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal infection</td>
<td>26.2%</td>
</tr>
<tr>
<td>gastroparesis</td>
<td>25.5%</td>
</tr>
<tr>
<td>pancreatic fistula</td>
<td><strong>14.89%</strong></td>
</tr>
<tr>
<td>intestine obstruction</td>
<td>8.5%</td>
</tr>
<tr>
<td>incision complications</td>
<td>7.8%</td>
</tr>
<tr>
<td>hemorrhage</td>
<td>7.8%</td>
</tr>
<tr>
<td>Anastomosis hemorrhage</td>
<td>2.8%</td>
</tr>
<tr>
<td>Abdomen hemorrhage</td>
<td>5.0%</td>
</tr>
<tr>
<td>acute cholecystitis</td>
<td>3.5%</td>
</tr>
<tr>
<td>Anatomosis leakage</td>
<td><strong>2.8%</strong></td>
</tr>
<tr>
<td>lymphatic leakage</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

**Non-surgical complications (7.14%)**

<table>
<thead>
<tr>
<th>Complication</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>respiratory system</td>
<td><strong>57.3%</strong></td>
</tr>
<tr>
<td>- pulmonary infection</td>
<td>29.3%</td>
</tr>
<tr>
<td>- pleural effusion</td>
<td>28.0%</td>
</tr>
<tr>
<td>cardiovascular system related</td>
<td>20.7%</td>
</tr>
<tr>
<td>embolism related</td>
<td><strong>6.1%</strong></td>
</tr>
<tr>
<td>- pulmonary embolism</td>
<td>3.7%</td>
</tr>
<tr>
<td>- deep venous thrombosis</td>
<td>2.4%</td>
</tr>
<tr>
<td>catheter-related</td>
<td>6.1%</td>
</tr>
<tr>
<td>urinary system</td>
<td>2.4%</td>
</tr>
<tr>
<td>others</td>
<td>7.3%</td>
</tr>
</tbody>
</table>

**Total complication rate: 19.4%; The rate of mortality was 0.17%**
How about our patients’ prognosis?

Follow-up is a tough work in China
GC data of radical gastrectomy from Zhongshan

- Consecutive GC inpatients of Shanghai residents in Zhongshan Hospital from 2003-2014
- Follow-up ended on 2016.6.30 / 37 (18-160) months

- 2669 patients (2839 total)
  - Gender: male, 1813; female, 856
  - Age: 20-86 yrs old; median: 65 yrs old

The follow-up rate: 95.1%

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The percentage of early gastric cancer (EGC)

21.28% in total
Overall survival of radical gastrectomy

n=2669
5year OS: 57.8%

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The survival of EGC and AGC

The percentage of Stage III and IV in AGC is 47.1%
The survival of different TNM stages

--- stage I (n=679) 5y-OS 95.3%
--- stage II (n=582) 5y-OS 74.2%
--- stage III (n=1347) 5y-OS 35.6%
--- stage IV (n=61) 5y-OS 6.9%

P<0.001
Adenocarcinoma of EGJ (AEG)

AEG 17.3% (463/2669)

Percentage of AEG: no significant changed (P=0.167)
The overall survival of AEG is worse than non-AEG

AEG (n=463) 5y-OS 47.3%
Non-AEG (n=2206) 5y-OS 60.6%

P<0.001
The overall survival of trans-abdominal cases is significantly better than left thoracic approach.

Trans-abdominal approach (n=322) 5y-OS 51.6%

Left thoracic approach (n=141) 5y-OS 38.1%

\[ P = 0.020 \]
GC clinical trial
The **Chinese Laparoscopic Gastrointestinal Surgery Study (CLASS) Group**

Established on Nov. 27th, 2009

**CLASS Mission:**
To improve patients’ quality of life by improved evidence-based practice of minimally invasive surgery.

Zhongshan Hospital is one of the six core members of CLASS

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Multi-center RCT

**CLASS-01**

- To Compare Long-term Outcomes Between LDG and ODG With D2 Lymphadenectomy for Advanced Gastric

- Enrollment and safety analysis have been completed

- Zhongshan Hospital contributed 168 cases (16%, 168/1056)

- "Morbidity and Mortality" has been published on *Journal of Clinical Oncology*
CLASS-02 Study

- Initiated by GC group of Zhongshan Hospital
- Laparoscopic Total Gastrectomy Versus Open Total Gastrectomy For Gastric Cancer: A Prospective Randomized Controlled Multicenter Trial
- Participants: 14 gastric cancer centers
- Started in December 2016
Perspectives

Currently, surgery is still the major treatment for gastroesophageal cancer

To address

✓ Training and popularizing the standardized procedures: D2 radical gastrectomy and minimal invasive surgery
✓ Clinical trials
✓ Collaborations: both domestic and international
Acknowledgements

Thanks
Prof. Jiafu Ji
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Gastric Cancer Group of Zhongshan Hospital

Department of General Surgery, Zhongshan Hospital
Acknowledgements

Department of General Surgery, Zhongshan Hospital
Thank you for your attention!